

APPENDIX B TO PART 179—PROCEDURES
FOR SIMULATED POOL AND TORCH-
FIRE TESTING

1. This test procedure is designed to measure the thermal effects of new or untried thermal protection systems and to test for system survivability when exposed to a 100-minute pool fire and a 30-minute torch fire.

2. *Simulated pool fire test.*

a. A pool-fire environment must be simulated in the following manner:

(1) The source of the simulated pool fire must be hydrocarbon fuel with a flame temperature of 871 °C plus or minus 55.6 °C (1600 °F plus-or-minus 100 °F) throughout the duration of the test.

(2) A square bare plate with thermal properties equivalent to the material of construction of the tank car must be used. The plate dimensions must be not less than one foot by one foot by nominal 1.6 cm (0.625 inch) thick. The bare plate must be instrumented with not less than nine thermocouples to record the thermal response of the bare plate. The thermocouples must be attached to the surface not exposed to the simulated pool fire and must be divided into nine equal squares with a thermocouple placed in the center of each square.

(3) The pool-fire simulator must be constructed in a manner that results in total flame engulfment of the front surface of the bare plate. The apex of the flame must be directed at the center of the plate.

(4) The bare plate holder must be constructed in such a manner that the only heat transfer to the back side of the bare plate is by heat conduction through the plate and not by other heat paths.

(5) Before the bare plate is exposed to the simulated pool fire, none of the temperature recording devices may indicate a plate temperature in excess of 37.8 °C (100 °F) nor less than 0 °C (32 °F).

(6) A minimum of two thermocouple devices must indicate 427 °C (800 °F) after 13 minutes, plus-or-minus one minute, of simulated pool-fire exposure.

b. A thermal protection system must be tested in the simulated pool-fire environment described in paragraph 2a of this appendix in the following manner:

(1) The thermal protection system must cover one side of a bare plate as described in paragraph 2a(2) of this appendix.

(2) The non-protected side of the bare plate must be instrumented with not less than nine thermocouples placed as described in paragraph 2a(2) of this appendix to record the thermal response of the plate.

(3) Before exposure to the pool-fire simulation, none of the thermocouples on the thermal protection system configuration may indicate a plate temperature in excess of 37.8 °C (100 °F) nor less than 0 °C (32 °F).

(4) The entire surface of the thermal protection system must be exposed to the simulated pool fire.

(5) A pool-fire simulation test must run for a minimum of 100 minutes. The thermal protection system must retard the heat flow to the plate so that none of the thermocouples on the non-protected side of the plate indicate a plate temperature in excess of 427 °C (800 °F).

(6) A minimum of three consecutive successful simulation fire tests must be performed for each thermal protection system.

3. *Simulated torch fire test.*

a. A torch-fire environment must be simulated in the following manner:

(1) The source of the simulated torch must be a hydrocarbon fuel with a flame temperature of 1,204 °C plus-or-minus 55.6 °C (2,200 °F plus or minus 100 °F), throughout the duration of the test. Furthermore, torch velocities must be 64.4 km/h \pm 16 km/h (40 mph \pm 10 mph) throughout the duration of the test.

(2) A square bare plate with thermal properties equivalent to the material of construction of the tank car must be used. The plate dimensions must be at least four feet by four feet by nominal 1.6 cm (0.625 inch) thick. The bare plate must be instrumented with not less than nine thermocouples to record the thermal response of the plate. The thermocouples must be attached to the surface not exposed to the simulated torch and must be divided into nine equal squares with a thermocouple placed in the center of each square.

(3) The bare plate holder must be constructed in such a manner that the only heat transfer to the back side of the plate is by heat conduction through the plate and not by other heat paths. The apex of the flame must be directed at the center of the plate.

(4) Before exposure to the simulated torch, none of the temperature recording devices may indicate a plate temperature in excess of 37.8 °C (100 °F) or less than 0 °C (32 °F).

(5) A minimum of two thermocouples must indicate 427 °C (800 °F) in four minutes, plus-or-minus 30 seconds, of torch simulation exposure.

b. A thermal protection system must be tested in the simulated torch-fire environment described in paragraph 3a of this appendix in the following manner:

(1) The thermal protection system must cover one side of the bare plate identical to that used to simulate a torch fire under paragraph 3a(2) of this appendix.

(2) The back of the bare plate must be instrumented with not less than nine thermocouples placed as described in paragraph 3a(2) of this appendix to record the thermal response of the material.

(3) Before exposure to the simulated torch, none of the thermocouples on the back side

of the thermal protection system configuration may indicate a plate temperature in excess of 37.8 °C (100 °F) nor less than 0 °C (32 °F).

(4) The entire outside surface of the thermal protection system must be exposed to the simulated torch-fire environment.

(5) A torch-simulation test must be run for a minimum of 30 minutes. The thermal protection system must retard the heat flow to the plate so that none of the thermocouples on the backside of the bare plate indicate a plate temperature in excess of 427 °C (800 °F).

(6) A minimum of two consecutive successful torch-simulation tests must be performed for each thermal protection system.

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PART 180—CONTINUING QUALIFICATION AND MAINTENANCE OF PACKAGINGS

Subpart A—General

Sec.

180.1 Purpose and scope.

180.2 Applicability.

180.3 General requirements.

Subpart B [Reserved]

Subpart C—Qualification, Maintenance and Use of Cylinders

180.201 Applicability.

180.203 Definitions.

180.205 General requirements for requalification of specification cylinders.

180.207 Requirements for requalification of UN pressure receptacles.

180.209 Requirements for requalification of specification cylinders.

180.211 Repair, rebuilding and reheat treatment of DOT-4 series specification cylinders.

180.212 Repair of seamless DOT 3-series specification cylinders and seamless UN pressure receptacles.

180.213 Requalification markings.

180.215 Reporting and record retention requirements.

180.217 Requalification requirements for MEGCs.

Subpart D—Qualification and Maintenance of IBCs

180.350 Applicability and definitions.

180.351 Qualification of IBCs.

180.352 Requirements for retest and inspection of IBCs.

Subpart E—Qualification and Maintenance of Cargo Tanks

180.401 Applicability.

180.403 Definitions.

180.405 Qualification of cargo tanks.

180.407 Requirements for test and inspection of specification cargo tanks.

180.409 Minimum qualifications for inspectors and testers.

180.411 Acceptable results of tests and inspections.

180.413 Repair, modification, stretching, rebarrelling, or mounting of specification cargo tanks.

180.415 Test and inspection markings.

180.416 Discharge system inspection and maintenance program for cargo tanks transporting liquefied compressed gases.

180.417 Reporting and record retention requirements.

Subpart F—Qualification and Maintenance of Tank Cars

180.501 Applicability.

180.503 Definitions.

180.505 Quality assurance program.

180.507 Qualification of tank cars.

180.509 Requirements for inspection and test of specification tank cars.

180.511 Acceptable results of inspections and tests.

180.513 Repairs, alterations, conversions, and modifications.

180.515 Markings.

180.517 Reporting and record retention requirements.

180.519 Periodic retest and inspection of tank cars other than single-unit tank car tanks.

Subpart G—Qualification and Maintenance of Portable Tanks

180.601 Applicability.

180.603 Qualification of portable tanks.

180.605 Requirements for periodic testing, inspection and repair of portable tanks.

APPENDIX A TO PART 180—INTERNAL SELF-CLOSING STOP VALVE EMERGENCY CLOSURE TEST FOR LIQUEFIED COMPRESSED GASES

APPENDIX B TO PART 180—ACCEPTABLE INTERNAL SELF-CLOSING STOP VALVE LEAKAGE TESTS FOR CARGO TANKS TRANSPORTING LIQUEFIED COMPRESSED GASES

APPENDIX C TO PART 180—EDDY CURRENT EXAMINATION WITH VISUAL INSPECTION FOR DOT 3AL CYLINDERS MANUFACTURED OF ALUMINUM ALLOY 6351-T6

APPENDIX D TO PART 180—HAZARDOUS MATERIALS CORROSIVE TO TANKS OR SERVICE EQUIPMENT

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